

NEW SPECIES AND NOTES ON CALIFORNIA
MAYFLIES. II*(Ephemeroptera)*

W. C. DAY

1021 Hubert Road, Oakland, California

The present paper is given to describe several new species of mayflies reared from nymphs collected by the author and his wife, Helen L. Day, on streams of northern California, to record the collection of species not heretofore taken in California, and to note new synonyms in the Ephemeroptera.

***Ephemerella levis* Day, new species**

(Figures 1, 2, and 3)

Male imago (in alcohol)

Length: Body 7.5 mm.; forewing 7.5 mm.; foreleg 6.25 mm.; tails 8 mm. *Head:* Pale yellow, widely washed with black; nasal carina and frontal margin white. Antenna pale smoky, basal segment brown and second segment pale. Ocelli milky white, ringed with black at base. A pair of narrow, black submedian stripes extend forward from posterior margin of head to median ocellus. Eyes large, orange, with lower portion black. *Thorax:* Pronotum pale yellow, extensively but lightly washed with black; a wide, black U-shaped mark, opening toward median line, parallels the margins on each side. Mesonotum pale yellow, median suture dark; a pair of short, dark dashes in antero-lateral corners; lateral areas of scutellum and entire metanotum, pale golden brown. A wide, V-shaped brown mark below base of forewing, anterior to coxa of middle leg. A prominent dark spot anterior to coxa of hind leg. Entire sternum golden brown, ganglionic areas marked with black on each of the thoracic segments. *Legs:* Yellowish white, foretibiae faintly smoky. Coxae, trochanters, and tarsal segments of middle and hind legs finely margined with hair-line of black; tibiae smoky at base. All tarsi with first segments faintly dark basally. *Wings:* Hyaline, stigmatic area of forewing milky white. Wingveins clear, colorless; a dark mark on subcosta near base. A wide, purplish black stripe lies between costa and subcosta, extending from humeral brace to base of wing. Axial cord of forewing dark purple. *Abdomen:* Segments 1-6 hyaline white, 7-10 opaque yellowish white. Tergites 3-7 with wide, dark bands on median portions of anterior margins; from terminals of these bands, a pair of short, wide, dark submedian bands direct themselves toward the median of posterior margin, but do not attain it. Central portions of tergites lightly surfaced with black. Tergites 1-9 marked with short, dark dashes or a pair of dark spots on each tergite on lateral margin just above pleural fold. Pleural fold pale. Ganglia darkened on sternites 1-7; dark stripes on lateral margins of sternites 1-9. *Genitalia:* Forceps and penes pale, smoky at tips. *Tails:* White, strongly banded with black at each joining.

Nymph (in alcohol)

Length: Body of male 7.5 to 8.0 mm.; female 7.5 to 8.5 mm. *Head:* Smooth, pale yellow, irregularly mottled with dark brown. Maxillary palp

fairly well developed for nymph of *serrata* group. *Thorax*: Pale yellow, irregularly mottled with dark brown anterior to wing roots. Sternum variably pale yellow, pale brown, or mottled brown. Ganglionic areas usually marked with black. *Legs*: Pale yellow, strongly marked with brown. Anterior surfaces of coxae brown. Trochanters pale, with large brown spot on ventral surface of each. Femora pale, with wide, brown bands near ends, on anterior surfaces only. Tibiae pale, each with wide, brown band at middle and at basal joining. Tarsi brown, each with pale band near distal end. Claws brown, 4-7 denticles on each. *Abdomen*: Without paired dorsal spines. Posterior margins of tergites 5-7 slightly sinuate. Tergites gray brown with darkened lateral areas and dark anterior margins on 1-7. In male nymph, tergite 5 is often pale. Abdominal segments 3-9 with well developed, flattened lateral extensions, each of which bears a postero-lateral spine; when viewed from above, the lateral spines of tergite 8 appear very short; the spines of tergite 3 are small but well formed. Sternites pale with ganglionic areas darkened; a single row of curved, brown marks along lateral margins. On well marked specimens, a row of four dark spots in a line paralleling and close to anterior margin of each sternite. *Gills*: Borne on segments 3-7. *Tails*: Alternately white and brown, each joining narrowly dark; a whorl of spines at each joining.

Holotype: Male imago; reared from nymph collected by the author on CAPELL CREEK, NAPA COUNTY, CALIFORNIA, June 14, 1952; in collection of the California Academy of Sciences. *Paratypes* (all topotypical): 1 ♂ in Canadian National Collection; 1 ♂ in collection of Cornell University; 1 ♂ in collection of G. F. Edmunds, Jr.; 3 ♂ in author's collection. *Nymphs*: 35 nymphs collected on Capell Creek on June 14, 1952, 40 collected on Capell Creek on May 20, 1950, and 25 collected on Sulphur Creek, Sonoma County on July 15, 1950. Nymphs have been sent with the male imagos listed above.

Ephemerella levis Day belongs to the *serrata* group of *Ephemerella*, and the male adult is identical in general appearance, maculation, and structure of the genitalia with *E. micheneri* Traver; however, the foretibia of *E. levis* is 50% longer than the forefemur, while that of *E. micheneri* is twice as long, these proportions being constant in all specimens examined. When describing the adults of *E. micheneri* in 1934, Dr. Traver tentatively associated the nymphs of this species with imagos taken at the same time and place; the writer has reared adults of *E. micheneri* from nymphs, and can confirm Traver's association of nymph and adult as being correct.

The nymph of *E. micheneri* has distinct and well formed submedian, paired dorsal spines on tergites 2-8, and postero-lateral spines on segments 4-9. The nymph of *E. levis* has no dorsal

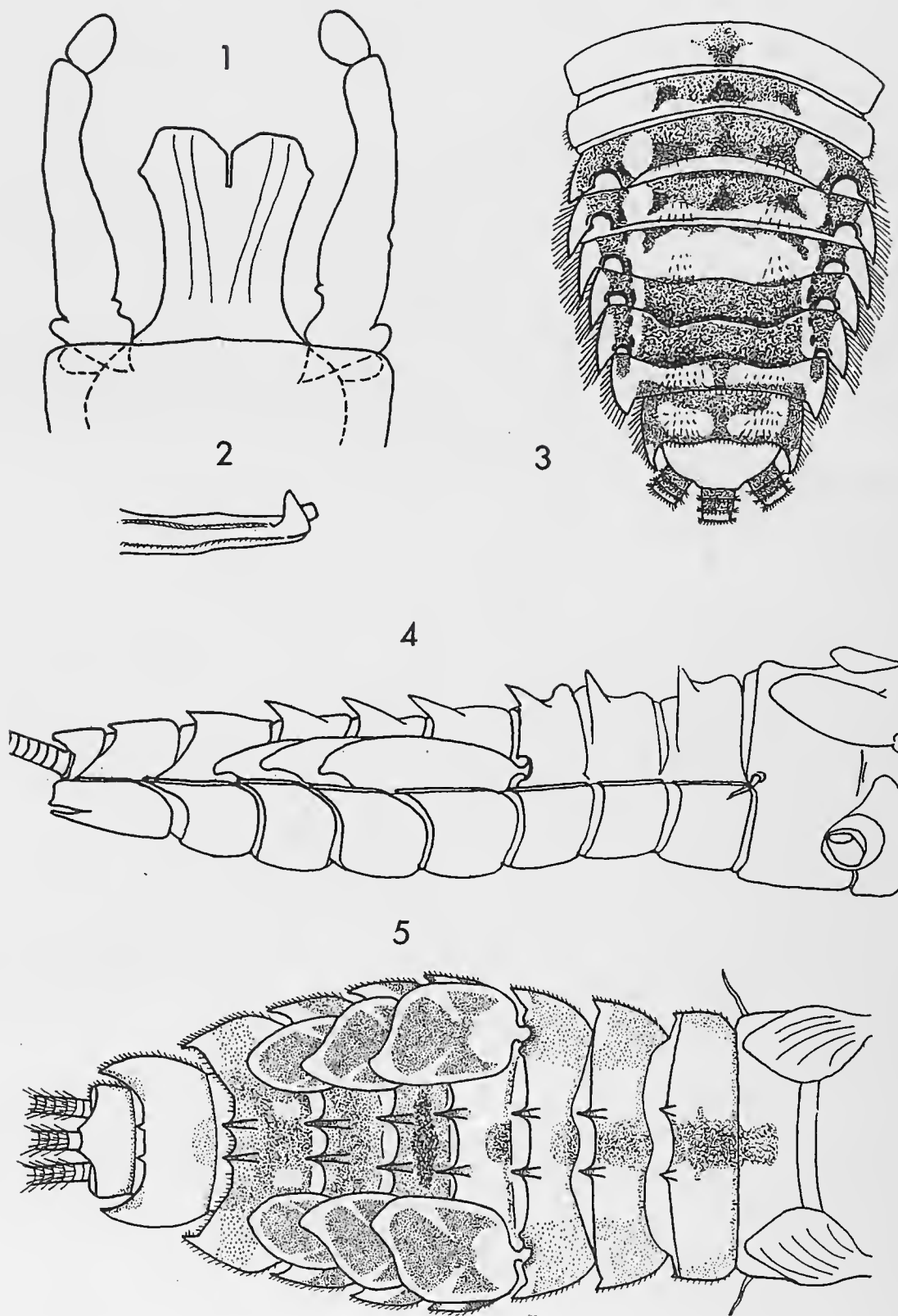


PLATE I

Fig. 1. *Ephemerella levis*, genitalia, ventral aspect; Fig. 2. *Ephemerella levis*, penes, lateral aspect; Fig. 3. *Ephemerella levis*, tergites of nymph; Fig. 4. *Ephemerella soquele*, abdomen of nymph, lateral aspect; Fig. 5. *Ephemerella soquele*, tergites of nymph.

spines, and bears postero-lateral spines on segments 3–9. In both species, the postero-lateral spines of segment 8 seem lacking when viewed from above. The lateral spines of *E. micheneri* nymphs are edged with strong, short spines; those of *E. levis* are softer, longer, and hair-like.

E. levis nymph is the exclusive western member of the *serrata* group lacking dorsal abdominal spines. On Capell Creek, the nymphs of both *E. micheneri* and *E. levis* are plentiful, and are found in shallow, slowly running water, resting on sandy bottoms; in this stream, the nymphs of *E. micheneri* mature about two weeks prior to those of *E. levis*. On Sulphur Creek, nymphs of *E. levis* were numerous, but *E. micheneri* could not be found.

The association of nymph and adult was established through rearing.

***Ephemerella soquele* Day, new species**

(Figures 4 and 5)

Nymph (in alcohol)

Length: Body 7.5 to 8 mm.; tails 3.5 mm. *Head:* Vertex pale with a pair of wide submedian pale brown stripes from ocelli to posterior margin; fronto-clypeus dark brown. Lateral margins of labrum black. Antero-lateral portion deeply cut away, exposing mandibles almost to base. *Thorax:* Pronotum pale, with a few brown spots; anterior and lateral margins straight and posterior margin slightly emarginate; a pair of low, blunt tubercles near median line, one on each side. Mesonotum pale, the developing scutum of the adult outlined in black; a pair of wide, dark submedian curved stripes extend the full length of the segment. *Legs:* Trochanters and coxae dark; femora pale, basally dark-marked and smoky. Tibiae pale, dark banded near apical ends, and femoro-tibial knees dark. Tarsi dark brown, narrowly pale basally. Claws pale smoky brown. *Abdomen:* Prominent lateral extensions on segments 3–9, each with postero-lateral spine; abdomen widest at segments 5 and 6; the postero-lateral spines of segment 3 are small, but well formed and distinct. Fine, sharp-pointed submedian abdominal spines are borne on tergites 2–9, being longest on tergites 6 and 7; these spines are elevated from the dorsal plane of tergites 2–4 about 60 degrees, but progressively decrease this angle to about 10 degrees on tergite 9. Tergites 1–5 pale, with lateral areas widely dark brown; tergites 1–5 with median brown areas. Tergites 6 and 7 solid dark brown, with a pair of small pale areas on anterior margins, one on each side. Tergite 8 with median area pale, dark brown on each side. Tergites 9 and 10 wholly pale. Lateral extensions dark brown, postero-lateral spines pale. Sternites dark brown, 8 and 9 sometimes pale with a few dark markings. Sternites with short hyaline-white submedian dashes based on anterior margins of 2–9; a single row of short dark dashes usually along lateral border at bases of lateral extensions. *Gills:* Borne on segments 4–7, those on 4–6 being semi-operculate; rudimentary gill on segment 1. *Tails:* Fringed with hairs on each side, hairs longest at middle, nearly bare at tips. Tails pale, tips dark.

Holotype: Male nymph; collected by Helen L. Day and the author at Soquel Meadow, WILLOW CREEK, MADERA COUNTY, CALIFORNIA, on July 14, 1951; in the collection of the California Academy of Sciences. *Paratypes*: 4 nymphs in California Academy of Sciences collection; 4 nymphs in Canadian National collection; 4 nymphs in Cornell University collection; 4 nymphs in G. F. Edmunds, Jr. collection. 20 nymphs in author's collection.

Ephemerella soquele Day belongs to the *simplex* group of this genus, and is most closely related to *E. margarita* Needham. In *E. margarita*, the paired dorsal abdominal spines are very short and are borne on segments 3–9; in *E. soquele*, these paired spines are borne on tergites 2–9, and are much larger and longer, those on 6 and 7 being more than one-fourth as long as the tergites on which they are located. The postero-lateral spines on *E. margarita* are found on segments 4–9; in *E. soquele* these spines are longer, more acute, and found on segments 3–9. The middle and hind legs of *E. margarita* are comparatively shorter than those of *E. soquele*. The outer margins of the mandibles of *E. margarita* are almost straight, while those of *E. soquele* are widely convex.

On Willow Creek, the nymphs of *E. soquele* were taken on a shallow, sandy bottom at the quiet, warm edge of a large pool.

***Rhithrogena decora* Day, new species**

(Figures 6, 7 and 8)

Male imago (in alcohol)

Length: Body 7.0 mm.; forewing 7.84 mm.; foreleg 5.6 mm.; tails 16.8 mm. *Head*: Pale yellow brown, nasal carina darker; frontal margin widely hyaline, speckled with fine, black spots, these spots larger and closer together in median portion. Ocelli black, centers milky. First joint of antenna short, pale, with white surrounding base; second joint longer, pale with dark tip, flagellum smoky with dark tip. Eyes contiguous, pale yellow brown, lower portions black. *Thorax*: Pronotum pale yellow, a short, wide, purple black stripe on medial portion of posterior margin. Mesonotum pale yellow, postero-lateral areas washed with pale brown; inner parapsidal and median furrows marked finely with black; scutellum and postscutellum dark brown; the median dorsal surface of scutellum and median area of scutum immediately anterior, chalky white. Scutellum of metanotum pale with four dark spots; postscutellum dark brown. Pleura pale yellow and chalky white, prominently marked with three wide purple black stripes, as follows: from the anterior point of attachment of wing base, a wide stripe extends forward to pronotum; from the same point of origin, a second wide stripe extends obliquely downward and across foreleg above forecoxa; posterior to and paralleling this latter stripe, another stripe extends from wing base down under the foreleg, terminating on the prosternum. A short, wide purple black stripe above each coxa. *Legs*: White, foreleg with femur yellowish, tibia and tarsi faintly

darker. Coxae each with black spot on apical margin. Femora finely margined with black at basal joining, and dark banded at distal end; strongly marked with short, black, longitudinal stripe at middle of anterior surfaces. Tarsal joinings finely black. Claws somewhat darkened. *Wings*: Clear and iridescent; longitudinal veins light gray, crossveins colorless; humeral brace blackish brown except for short portion near and at costa. Stigmatic area of the forewing, milky white. Of the 15–18 crossveins of the stigmatic area, three or four are usually forked or anastomosed, while numerous specimens have these crossveins simple and unforked. *Abdomen*: Tergite 1 purplish brown, anterior margin white; 9 and 10 chalky white. Tergites 2–8 washed with purplish brown, posterior margins darker, marked with hyaline white pattern as follows: large triangles in the four corners; paramedian spots one-quarter distant from posterior margin; wide, curved stripes based on anterior margin almost reaching paramedian spots; a narrow median stripe. Sternites 7–9 largely chalky white; 1–6 hyaline white. *Genitalia*: Forceps and penes smoky. *Tails*: Smoky, lighter at tips; a few sections at base faintly dark ringed at joinings.

Female imago, (in alcohol)

Female slightly larger and much paler than male, the abdomen being a light, rosy purple.

Nymph, (in alcohol)

Length: Body of male 6.0 mm.; female 7.0 mm. *Head*: Concolorous blackish brown, posterior margin paler; epicranial sutures hyaline white. *Thorax*: Notal surfaces, including wingpads, blackish brown, with a solid white band across posterior half of mesonotum and bases of wingpads; near anterior border of this white band, a pair of small, circular dark spots near lateral margins, one on each side; a narrow white median stripe extends the full length of both segments. *Legs*: Femora medium brown, anterior surfaces with large white area on basal half, and smaller white area at distal end; in middle of basal white area, a large black spot and 4–5 tiny spots; dorsal edge with numerous spines. Tibiae smoky. Tarsi pale, distally dark banded. Claws smoky. *Abdomen*: Tergites 1–4 medium brown, 6–10 blackish brown. Tergite 5 white, lateral margins widely dark brown; posterior third of tergite 4 and anterior third of tergite 6 sometimes white. Small paramedian dark spots usually found on tergites 3 and 4. Spiracles marked with large dark spots. Posterior margins of tergites 1–10 set with numerous fine denticles. Sternites brown, very pale on sternite 1, progressively darker to sternite 9 which is very dark; lateral margins blackish brown; a short, black stripe in median portion, parallel and close to each posterior margin; half-way between lateral margins and median line, and parallel to latter, a long, narrow white stripe; oblique white dashes are based on anterior margins near median line; paramedian white spots usually on sternite 8. *Gills*: Lamellae translucent white, tracheae smoky; fibrillae smoky. Lamellate gills 1–6 “eared”, the “ear” of gill 1 being very small, and those of 3–5 proportionately very large. *Tails*: White.

Holotype: Male imago, collected by author and Helen L. Day on HAT CREEK, SHASTA COUNTY, CALIFORNIA, July 21, 1953; in collection of California Academy of Sciences. *Allotype*: Female

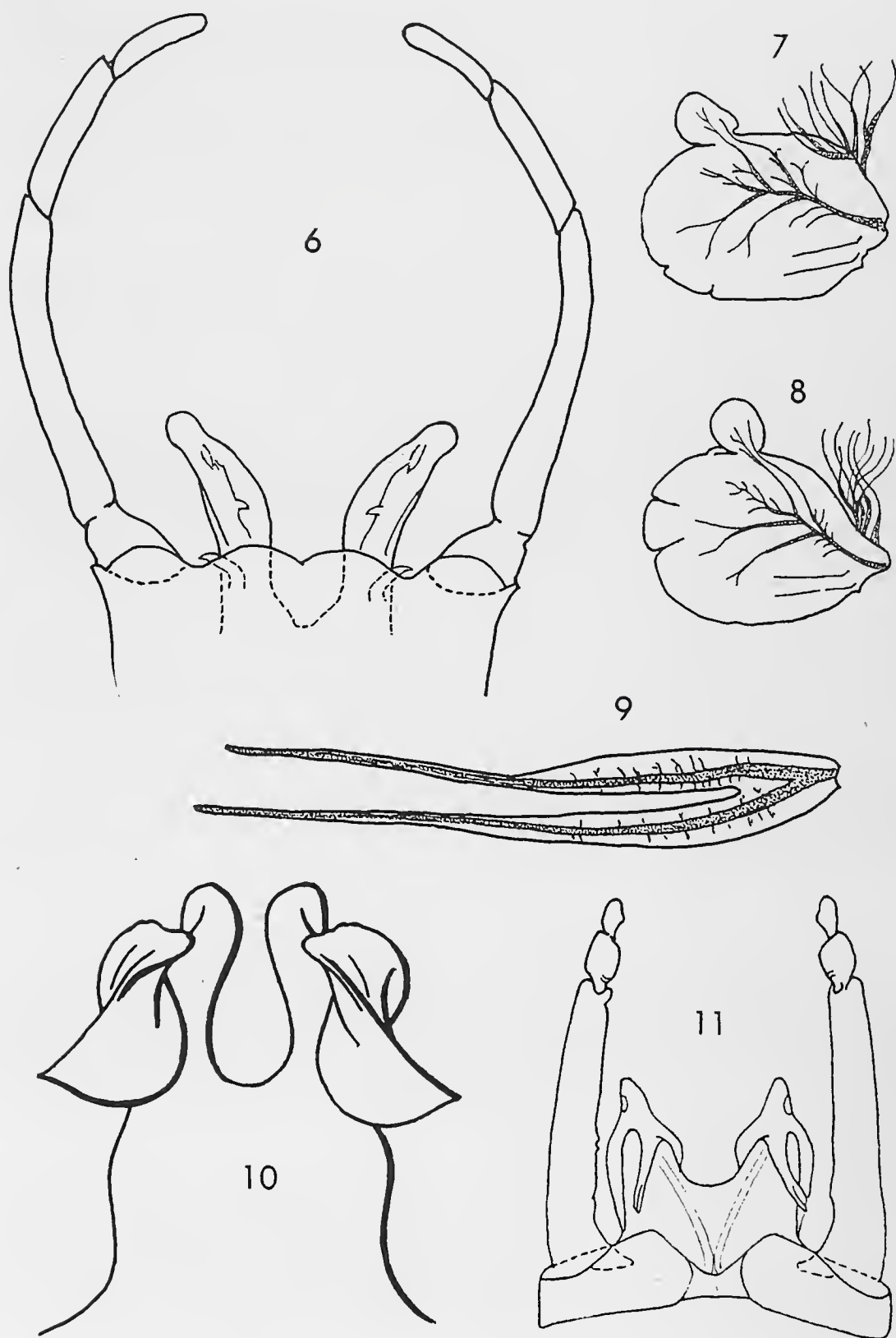


PLATE II

Fig. 6. *Rhithrogena decora*, genitalia, ventral aspect; Fig. 7. *Rhithrogena decora*, third nymphal gill; Fig. 8. *Rhithrogena decora*, fifth nymphal gill; Fig. 9. *Paraleptophlebia cachea*, third nymphal gill; Fig. 10. *Paraleptophlebia gregalis*, penes, ventral aspect; Fig. 11. *Paraleptophlebia cachea*, genitalia, ventral aspect.

imago, same data. *Paratypes* (all topotypical): 3 ♂ in Canadian National Collection; 3 ♂ in Cornell University Collection; 3 ♂ to G. F. Edmunds, Jr.; 65 ♂ in author's collection. *Nymphs*: 50 nymphs collected between Emigrant Crossing and Boundary Camp on Hat Creek, July 15 to July 30, 1953. Nymphs have been sent with the male imagos listed above. The association of nymph and adult was established through rearing.

Diagnosis: *Rhithrogena decora* Day is of the *brunnae* type, and is much smaller than any *Rhithrogena* found in California to date. The nymph is recognized by the wide white banding of the thorax which contrasts strongly with the small dark body. This species seems quite tolerant of temperature differences, nymphs being well developed in various sections of Hat Creek that varied from 50° to 62° F. measured at 3:00 P. M. Nymphal emergence occurs from 5:00 to 6:30 P. M., and the adults are attracted to light.

R. decora occurs in close association with what I now refer to as *Rhithrogena californica*, n. sp., a medium brown species very closely related to *R. doddsi*. During the last week in July, 1953, the last of the *R. decora* were emerging at the same time as the first of the *R. californica* were emerging.

Compared to other California *Rhithrogena*, *R. decora* seems most stable in the form and spining of the penes. In all specimens examined, the arms of the penes are narrowed and rounded at the tips, and slightly divergent; one strong mid-ventral tooth is found on each arm, and the apical spines, which can be seen only at high magnifications, are little more than fine, scattered hairs.

***Paraleptophlebia cachea* Day, new species**

(Figures 9, and 11)

Male imago (in alcohol)

Length: Body 9.0 mm.; forewing 9.0 mm.; foreleg 9.0 mm.; tails 13.0 mm. *Head*: Fuscous, frontal margin widely translucent pale brown; a wide, pale brown median stripe on vertex. Eyes almost contiguous, pale with lower portion black. Ocelli milky white, bases black. First two segments of antenna brown, flagellum dark smoky, tips white. *Thorax*: Pronotum brown, median portion of anterior and posterior margins and median line with black stripes. Mesonotum fuscous, lateral and anterior margins yellow marked with fuscous; margins and area anterior to scutellum black. Sclerites of pleuron dark brown, membranous areas yellow. Metanotum dark brown with black markings. *Legs*: Femora medium golden brown, forefemur darkened at distal end. Tibiae light brown; tarsi pale. *Wings*: Faintly milky, stigmatic area light brown tinted and translucent. Wing veins yellow brown, progressively paler toward posterior margin. *Abdomen*: Tergite 1 dark brown; 7-10

medium golden brown; 2-6 yellow brown. Anterior margins of tergites and geminate stripes along pleural fold smoky; a fine black mark from spiracles to postero-lateral corners. Tergites 2-10 with median dark stripe and short oblique dark dashes from a point near median of anterior margin. Sternites 1 and 8 medium brown with small, dark paramedian spots. Sternite 9 with dark brown W-shaped mark based on anterior margin, occupying about one-half the area of this sternite; remainder of sternite 9 white. Sternites 2-7 pale yellow brown, anterior margins usually dark; small paramedian dark spots present, as well as very short dark oblique dashes based close to anterior margins. Ganglionic areas of sternites 2-7 usually very faintly brown tinted. *Genitalia*: Forceps base, forceps and penes light, bright brown. *Tails*: Yellow brown, paling distally; joinings narrowly marked with red brown.

Female imago (in alcohol)

Female imago larger and lacking strong color contrasts of male imago. Head and mesonotum medium dark brown; abdomen more reddish and concolorous than male imago. Abdominal markings as in male; wing veins heavier and stronger in color than male, being dark red brown.

Nymph (in alcohol)

Length: Body of male 8.0 mm.; female 9.0 mm. *Head*: Dark red brown, white areas laterad and cephalad of ocelli. Antenna pale at base, darkening distally, 5 mm. in length. *Thorax*: Notum dark red brown, anterior margins of pronotum and mesonotum black. Developing scutellum of mesothorax black. *Legs*: Coxae and tronchanters dark brown. Femora and tibiae pale brown. Tarsi dark brown. Claws dark at base, white tipped, with 18-21 fine denticles on inner margin of each. Ventral margins of all segments closely set with fine spines, those of dorsal margins being coarser and less numerous; a ring of strong spines near apical margins of tibiae. *Abdomen*: Dark red brown, unmarked; overlapping of tergites gives appearance of wide black posterior margins of these. Sternites pale yellow brown, very widely dark brown laterally; anterior margins narrowly black; dark spots and oblique dashes of adult can be faintly seen. Sharp postero-lateral spines borne on segments 8 and 9; short, blunt spines on segment 7. In the nymphal cast skin, adult pattern of the tergites can be seen clearly. *Gills*: Broadly lanceolate, divided almost to base. Tracheae strongly dark, as are a few tracheoles. *Tails*: Light brown, pale lateral hairs stemming from joinings.

Holotype: Male imago, reared from nymph collected by the author and Helen L. Day on small tributary of CACHE CREEK, YOLO COUNTY, CALIFORNIA, 6 miles north of Rumsey, April 19, 1953; in collection of California Academy of Sciences. *Allotype*: Female imago, same data. *Paratypes* (all topotypical): 1 ♂ in Canadian National Collection; 1 ♂ in Cornell University Collection; 1 ♂ to G. F. Edmunds, Jr.; 8 ♂ of April 19, 1953, 6 ♂ and 3 ♀ of April 26, 1953, and 4 ♂ of May 17, 1952 in author's collection. *Nymphs*: Nymphs and cast skins have been sent with types and paratypes listed above; the author retains 8 nymphs and

12 cast skins. The association of nymph and adult was established through rearing.

Diagnosis: The form of the penes of *P. cachea* Day shows no least variation among the male adults collected in two different years, and serves to separate this species from *P. californica* and *P. quisquilia*. From the latter two species, *P. cachea* may also be separated by the markings of the abdomen, and by the blackness of the dorsum of both male adult and nymph of the new species.

The nymphs of *P. cachea* are adapted to unusually high water temperatures as we found them actively moving about in a small, slow moving creek of 72° to 76° F. at 3:00 P. M. All other nymphs of *Paraleptophlebia* observed by the author emerge at water temperatures of 48° to 60° F.

AMELETUS VALIDUS McDunnough

(Figures 12 and 14)

Ameletus validus McDunnough, 1923. Canad. Ent. 55:50

Through the kindness of Mr. W. J. Brown of the Canadian National Collection, I have examined the paratype of the above species, and a slide of the genitalia of same, taken at Banff, Alberta, on September 30, 1922 by C. B. D. Garrett, and can now state that the same late season species is also found in California. From September 26 to September 30, 1953, the author and his wife took nymphs for rearing from the Upper Truckee River, El Dorado County, California, which proved to be *A. validus*.

In this stream, with water at 52° F. at 3:00 P. M., the nymph emerges for about two hours starting at 10:30 A. M. The nymph is found only where well protected from the slightest current at the water's edge, between and behind small stones. In emerging, the nymph crawls entirely out of the water, breaks out of the skin, dries the wings for up to 21 minutes, and flies high into nearby trees. The only other mature nymph found in association with *A. validus* was *Paraleptophlebia debilis*.

As an aid to identification, a drawing of the genitalia of *A. validus* is given as a part of this paper.

RHITHROGENA FLAVIANULA McDunnough

(Figure 13)

Heptagenia flavianula McDunnough, 1924. Canad. Ent. 56:225

By comparison with a paratype and genitalia slide of the above species, loaned by the Canadian National Collection, verification has been made of the collection of *R. flavianula* on the West Fork

of the Carson River, Alpine County, California. The drawing of the penes given at the time of description of *R. flavianula* lacks several details, so a new drawing is presented herewith.

As is true of other species of the genus *Rhithrogena*, the uprightness or divergence of the arms of the penes cannot be depended upon as a character for the separation of species, as in several species of *Rhithrogena* there is great variation shown in this degree of divergence. In several species of *Rhithrogena* there is also found considerable variation in the size and numbers of teeth and/or spines on the penes of the male adult.

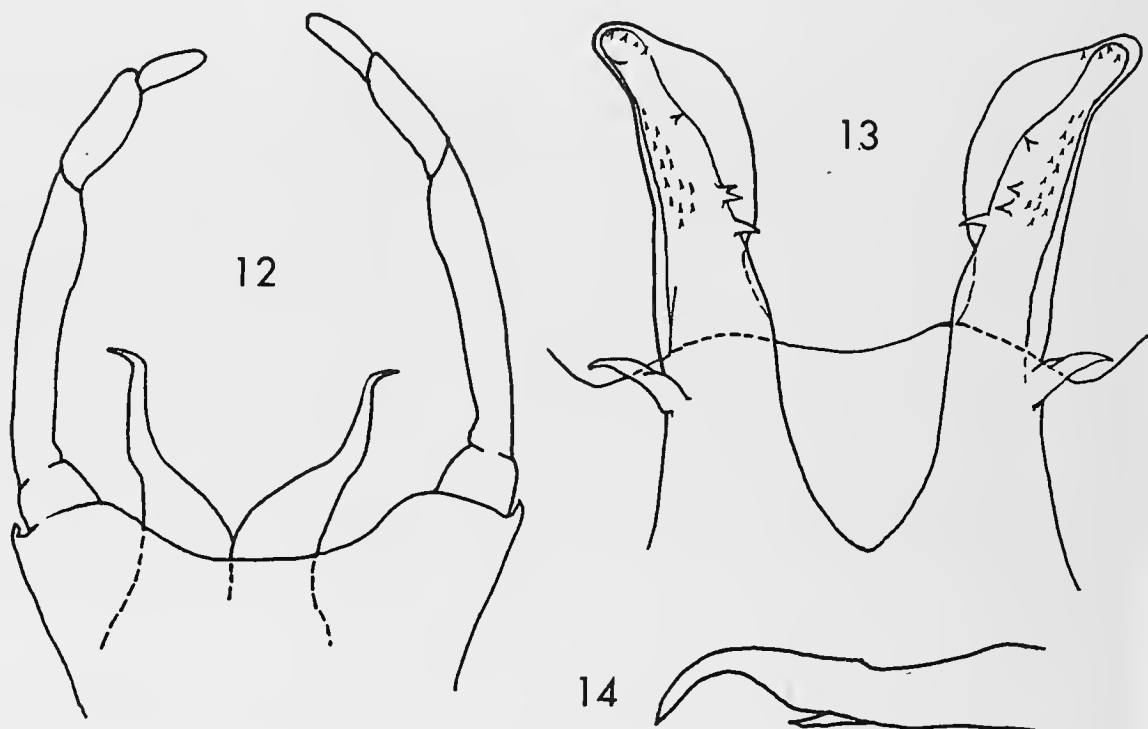


PLATE III

Fig. 12. *Ameletus validus*, genitalia, ventral aspect; Fig. 13. *Rhithrogena flavianula*, penes, dorsal aspect; Fig. 14. *Ameletus validus*, penes, lateral aspect.

EPHEMERELLA HYSTRIX Traver

Ephemerella hystrix Traver, 1934. J. Elisha Mitchell Sci. Soc. 50:212

Ephemerella spinosa Mayo, 1951. Pan-Pac. Ento. 27:122

Examination of the holotypes of *E. hystrix* and *E. spinosa*, together with many specimens of *E. hystrix* collected by the author in five counties of California, leads to the conclusion that *E. spinosa* is a synonym of *E. hystrix*. A micro-slide of mouthparts of *E. hystrix* from Cornell University Collection bears the same collecting data as the holotype, and shows these mouthparts to be identical with those of the California species.

The holotype nymph is faded, but the small denticles on the abdominal spines are easily seen and precisely like those of the California specimens in size and placement. Even though faded, the Cornell holotype shows the distinctive maculation of tergites and sternites, and the dark pattern of the gills just as they are seen in all California specimens. The holotype is broader proportionately than some California specimens, and less broad than others.

Like all other species of long-spined *Ephemerella* collected by the author, I find considerable variation in the length, curvature and inclination of the dorsal spines of the California *E. hystrix*, and the holotype nymph falls well within the limits of these variations.

EPHEMERELLA PROSERPINA Traver

Ephemerella proserpina Traver, 1934. J. Elisha Mitchell Sci. Soc. 50:223

Ephemerella yosemite Traver, 1934. J. Elisha Mitchell Sci. Soc. 50:225

E. proserpina was described from a single nymph taken in the San Bernardino Mts. of California, and *E. yosemite* from ten quite immature nymphs from Central and Northern California. I have examined the above specimens and collected many mature and immature nymphs of this species from seven California Counties; recently, a mature specimen of the species, collected in the San Bernardino Mts., was received from John Belkin. I feel certain that but one species is involved in all the above material, and that *E. yosemite* is a synonym of *E. proserpina*.

The variation in this species is typical of the nymphs of the long-spined *Ephemerella*, and can be demonstrated in the following analysis of a few characters in twenty-four mature nymphs of *E. proserpina* taken from one area of about sixty square feet on East Fork Carson River on July 3, 1949.

AA 19 have posterior pair pronotal tubercles of equal height

of these

13 with low submarginal pronotal tubercles

6 with higher submarginal pronotal tubercles

12 with margin of 9th. segment flared

7 with margin of 9th. segment straight

BB 5 have posterior pair pronotal tubercles unequal in height

of these

2 with low submarginal pronotal tubercles

3 with higher submarginal pronotal tubercles

5 with margin of 9th segment straight

Male and female adults of *E. proserpina* have been reared and will be described in another paper.

PARALEPTOPHLEBIA GREGALIS Eaton

(Figure 10)

Leptophlebia gregalis Eaton, 1884. Trans. Linn. Soc. London, Sec. Ser. Zool. 2:98

Leptophlebia invalida McDunnough, 1926. Canad. Ent. 58:297

In connection with correspondence concerning *P. gregalis*, Mr. D. E. Kimmins of the British Museum (Natural History) has recently cleared in KOH "the genitalia of a paratype which appeared identical with the type in the dried state," and has supplied me with a fine drawing, which is reproduced herewith. Mr. Kimmins' drawing gives, for the first time, the true appearance of this taxonomic feature that is essential to the correct separation of *P. gregalis*.

Comparison of a Canadian National Collection micro-slide of the genitalia of a paratype of *P. invalida* with the above drawing from Mr. Kimmins, would seem to establish the fact that *P. invalida* is a synonym of *P. gregalis*; the possibility of this synonymy was first suggested by McDunnough in his original description of *P. invalida*.

P. sculleni may also prove to be a synonym of *P. gregalis*. *P. sculleni* was described from a now broken-up single male adult, this specimen having had forelegs missing when described. The slide of the genitalia made from the holotype of *P. sculleni* is in excellent condition, and shows marked similarities to *P. gregalis*, notably in the apical lobes of the penes, opening between same, and the unique, widely curved lower margins of the reflex spurs shown in the sketch from Mr. Kimmins. The type locality of *P. gregalis* was given as "Mt. Hood" and that of *P. sculleni* as "Corvallis, Oregon"; these localities are about 100 miles apart.

SIPHONURUS SPECTABILIS Traver

Siphonurus spectabilis Traver, 1934. J. Elisha Mitchell Sci. Soc. 50:233

Siphonurus maria Mayo, 1939. Pan-Pac. Ento. 15:145

The author has examined the type material of *S. spectabilis* and that of *S. maria*, has re-collected and reared adults at the type localities of both species, and collected specimens of this very common species in 14 California counties. I feel sure that but one species of the two is valid, and that *S. maria* is a synonym of *S. spectabilis*.

The original description of the male adult of *S. spectabilis* was drawn from the single male adult collected, and it seems probable to me that this was a teneral or improperly preserved specimen;

the Mayo description of *S. maria* perfectly describes the specimens that I collected on Waddell Creek, the type locality of *S. spectabilis*.

In connection with several points made in the diagnosis of *S. maria* accompanying the species description (P.P.E. 15:148), *S. spectabilis* from Waddell Creek and elsewhere is usually dark red brown in life, forewings are speckled as in specimens from Amador County, and hindwings nearly or wholly dark orange brown. The Waddell male adult has the oblique band across the eyes, and I can find no differences in size of spines of the penes nor length of the forceps except in proportion to the size of the specimen, which is variable. Both the color of the abdomen and hind wing of the male adult varies from one location to another, and in specimens collected at different times from one location; there is some reason to believe that the later hatch is smaller and paler, as in several species of the genus *Callibaetis*.

New Records of Mayflies in California

The author and his wife, Helen L. Day, have collected in California several known species not previously reported from this State, as follows:

Species	Area of type locality	Collected in California
<i>Heptagenia elegantula</i> Eaton	Colorado	Stanislaus County
<i>Rhithrogena doddsi</i> McDunnough	Alberta	Montane
<i>Rhithrogena morrisoni</i> Banks	Nevada	General
<i>Cinygmula uniformis</i> McDunnough	B. C.	Coast Range
<i>Iron (Epeorus) albertae</i> McDunnough	Alberta	General
<i>Iron (Epeorus) dulciana</i> McDunnough	B. C.	Sierra Nevada
<i>Iron (Epeorus) longimanus</i> Eaton	Colorado	General
<i>Siphonurus occidentalis</i> Eaton	Colo. - Wash.	No. Calif.
<i>Paraleptophlebia debilis</i> Walker	N. S.	General
<i>Ephemerella heterocaudata</i> McDunnough	Wyo. - Mont.	Montane
<i>Ephemerella coloradensis</i> Dodds	Colorado	Montane
<i>Baetis insignificans</i> McDunnough	B. C.	Siskiyou County
<i>Baetis intermedius</i> Dodds	Colorado	Sierra Nevada
<i>Baetis tricaudatus</i> Dodds	Colorado	Sierra Nevada
<i>Centroptilum convexum</i> Ide	Ontario	No. Calif. Coastal

REFERENCES

EATON, A. E.

1883-1888. A revisional monograph of the recent Ephemeridae or mayflies. Trans. Linn. Soc. London, Sec. Ser. Zool. 3:1-352, pls. 1-65.

MAYO, VELMA KNOX

1939. New Western Ephemeroptera. Pan-Pacific Ent. 15(4):145-154, figs. 1-21.

1951. New Western Ephemeroptera II. Pan-Pacific Ent. 27(3):121-145, figs. 1-10.

MCDUNNOUGH, J.

1923. New Canadian Ephemeridae with notes. Canad. Ent. 55(2):50-51, figs. 1-3.
1924. New North American Ephemeridae. Canad. Ent. 56(9):221-226, pl. 5.
1926. New Canadian Ephemeridae with Notes. Canad. Ent. 58(12):296-302, pl. 3.

TRAVER, J. R.

1934. New North American species of mayflies. Jour. of the Elisha Mitchell Sci. Soc. 50:189-254, pl. 16.

NEW SPECIES OF CALIFORNIA MAYFLIES IN THE GENUS BAETIS

(Ephemeroptera)

W. C. DAY

1021 Hubert Road, Oakland, California

Living under conditions of great variety, representatives of the genus *Baetis* are found in many types of moving fresh water in California. The small nymphs have adapted themselves to a wide range of temperatures and climates, and are taken at all elevations and at many seasons.

The adult swarms ordinarily consist of a large number of individuals, and flights often occur in bright daylight. Heavily preyed upon by birds and insects, the large populations of *Baetis* are probably a most important element in their survival.

In the present paper, four new *Baetis* are described, these possibly having speciated in the Coastal Valleys of this State.

Baetis leechi Day, new species

(Figures 1 and 2)

Male imago (in alcohol)

Length: Body 4.0 mm.; forewing 4.0 mm.; foreleg 4.0 mm.; tails 9.0 mm.
Head: Pale yellow brown, posterior margin finely black; a broad median Y-shaped black stripe running cephalad from posterior margin, forks into a pair of submedian fine stripes which terminate at lateral ocelli. Basal segment of antenna brown, second segment and filament yellow. Eyes .6 mm. on longest diameter; stalks .4 mm. in height, measured up the outer side.
Thorax: Pronotum yellow washed with black. Mesonotum bright red brown, median suture and margins of scutum finely black. Scutellum pale, a pair of very small submedian pale spots anterior to this pale area; heavily margined with black. Sternum with brown sclerites outlined in black. *Legs:* Coxae brown; foreleg smoky with femur darker; middle and hindlegs pale.
Wings: Hyaline, stigmatic area strongly milky and with 3-5 crossveins